



C-Series Cameras Users Guide

PPT Publication #843-0099 Rev K



Disclaimer

PPT VISION, Inc. makes no representations or warranties for merchantability or fitness for any particular purpose, as regards PPT Vision's hardware or software. PPT Vision shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication or its contents.

PPT Vision reserves the right to revise this publication and to make changes in the content hereof without obligation to notify any person of such revision or changes.

Under the copyright laws, this publication may not be copied, photocopied, reproduced, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of PPT Vision.

Telephone: (952) 996-9500

Facsimile: (952) 996-9501

Web site: pptvision.com

Impact, Digital Serial Link, and DSL are trademarks of PPT VISION, Inc.

Copyright © 1997-2012 PPT VISION, Inc. All Rights Reserved

Technical Support

If you have technical questions about the operation of any PPT Vision products, contact your distributor or PPT Vision.

PPT C-Series Cameras

This document describes digital cameras manufactured by PPT Vision and Camera Link cameras manufactured by other companies. All the cameras in this document can be used with PPT's C-Series machine vision micro-system.

PPT Vision does not support the use of these cameras in any manner other than described herein.

Table of Contents

Safety Precautions.....2

General Information 3

Mounting a Camera 4

PPT-5700 Remote Head Dimensions 5

Connecting a Camera 6

LED Indicator 7

Setup and calibration 7

DSL-5000 8

DSL-5100.....10

PPT-5200.....12

PPT-5300.....13

PPT-5700.....14

PPT-6200.....16

DSL-7000.....17

PPT-7300.....20

PPT-8200.....21

PPT-9200.....23

PPT-9300.....24

Camera Link Cameras 25

Safety Precautions

Read all of the following instructions before setting up your camera. **Save this document for later use.**

1. Follow all warnings and instructions in this manual and in other user guides shipped with your hardware components.
2. Do not attempt to disassemble the camera. Do not remove screws or attachments. There are no user-serviceable parts inside. Refer servicing to PPT Vision or your local distributor.
3. All PPT digital cameras connect to the vision device using a standard Digital Serial Link (DSL) cable (Part # 431-0452-xx). Do not attempt to use any other cable. (See page 26 for Camera Link cables.)
4. This camera is designed for indoor use. Do not expose it to moisture, including rain or snow, and avoid operating it in wet areas. Should the camera become wet, turn off the power immediately. Moisture can damage the camera and create danger of electric shock. Avoid using the camera when the humidity is above 80%.
5. Make sure your camera has enough airflow for proper ventilation. The maximum safe case temperature during operation is 45° C (114° F).
6. Mount the camera body in a fixed position where it will not be subject to excessive vibration. To reduce stress on the camera connectors and cable, loop the cable and fasten it to the camera's mounting block. Do not crimp or tie the cable tightly with wire ties as this may damage it internally. The cable's minimum bend radius is fifteen times the cable diameter. It is not intended for continuous flexing or movement.

General Information

PPT's digital cameras digitize images at the camera source and transmit them directly to the vision system as a digital signal. All PPT cameras provide 8-bit resolution using internal 10-bit A/D converters and some have progressive scan shutter exposure (allowing individual pixel readings).

Cameras have a hard-coat finish case that helps eliminate ground loops. All camera settings (shutter, strobe, partial scan, etc.) are configured using Impact software and are maintained in the camera's memory so there are no physical switches on the cameras.

PPT Vision cameras connect to the vision device with a standard DSL cable (Part # 431-0452-xx).

All cameras can be used with PPT's C-Series machine vision micro-systems.

Before you install the camera

Carefully remove the camera and cabling from the shipping package and inspect each item. Save all packing materials so you can repack the camera in case you need to move or ship it.

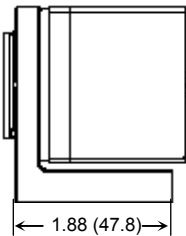
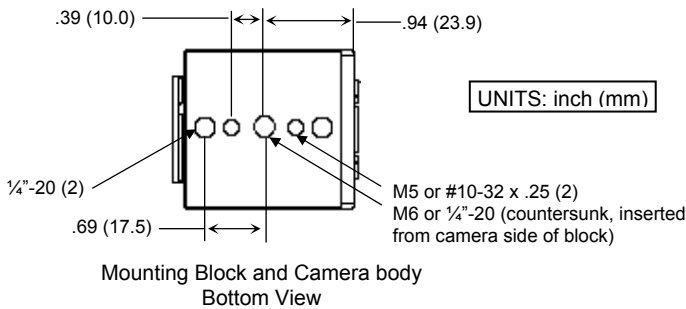
Extreme temperature precautions: If your camera arrives in very hot or cold weather, allow it to reach room temperature before using it. Wait for any condensation to dry completely before connecting it to the vision device.

Check the intended installation area to be sure there is enough room for the camera and any lighting that may be needed. Avoid areas with excessive heat, vibration, and environmental contaminants. Mount cameras away from devices that emit large amounts of electromagnetic energy. Be sure that cables are safely routed away from vehicle and pedestrian traffic. Do not crimp or tie the cable tightly with wire ties as this may damage it internally. The cable is not intended for continuous flexing or movement. The cable's minimum bend radius is fifteen times the cable diameter.

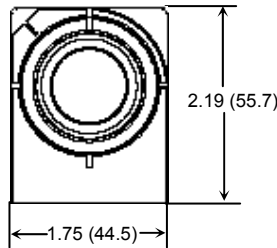
Camera Dimensions

NOTE: The DSL-5000, DSL-5100, and DSL-7000 cameras in this document have an older body style. Refer to the Digital Camera Users Guide (843-0085) for mounting dimensions.

The camera with a mounting block, but without a lens, weighs 0.44 pounds (200 grams).



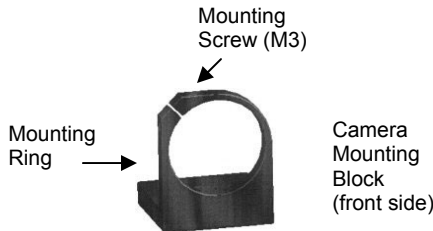
Side View



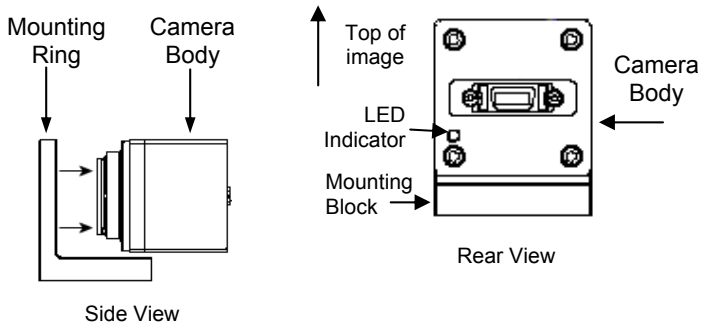
Front View

Mounting a Camera

To mount the digital cameras, attach a mounting block (Part # 381-1114) to the front of the camera.



1. Remove the lens from the camera body. Turn the mounting screw counter-clockwise to loosen the mounting ring.
2. If desired, insert a fastener through the countersunk hole in the center of the bracket. Rotate the camera body so the image will be in the desired orientation when the camera is mounted. Place the mounting ring over the front of the camera body with the mounting block facing the rear of the camera. (See diagram below.)
3. With the ring held tightly against the camera body, turn the mounting screw clockwise to tighten the ring and secure it to the camera. To adjust camera orientation up to five degrees after it is mounted, loosen the screw slightly, turn the camera body, then tighten the screw.
4. Secure the mounting block to a rigid surface for proper stability and heat transfer. Use fasteners in the pre-threaded holes in the bottom of the mounting bracket, or through the camera-side countersunk hole in the center of the bracket. (See Camera Dimensions on page 4.)



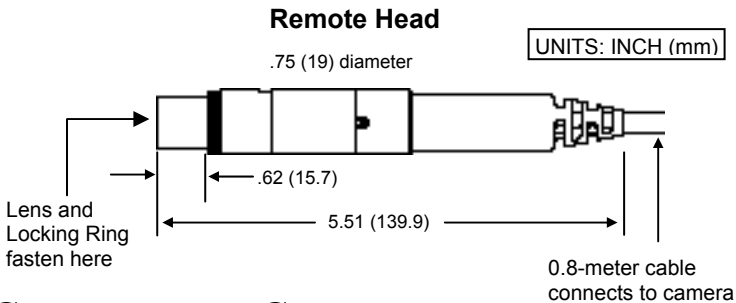
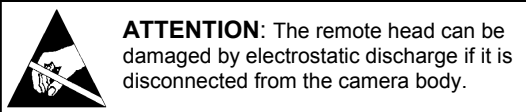
PPT-5700 Remote Head Dimensions

The PPT-5700 camera has a small remote head with a 0.8 meter cable attached to the camera body with a sixteen-pin connector.

The camera body, remote head, and connecting cable must be mounted in a fixed position. The cable is not intended for continuous flexing or movement.

Route the connecting cable away from devices that emit large amounts of electromagnetic energy, such as electric motors or solenoids. They may cause interference with image transmission.

Use a lens locking ring (Part # 381-1247) to secure a micro-lens on the remote head.

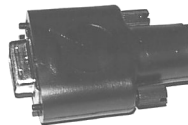


Connecting a Camera

Use only a standard DSL cable (Part # 431-0452-xx) to connect the camera to the vision device. The maximum allowable cable length is 25 meters (82 feet).

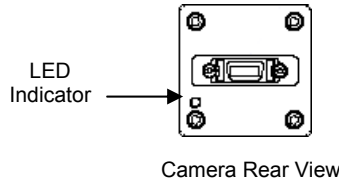
To connect the cable, align the connector with the camera or device connector, push gently until the cable seats securely, then tighten the connector screws. To disconnect it, loosen the screws completely, then grasp the connector and gently pull.

DSL Cable Connector
(431-0452-xx)



NOTE: To reduce stress on the cable and connectors, loop the cable and fasten it to the camera's mounting block. Do not crimp or tie the cable tightly with wire ties as this may damage it internally. The cable is not intended for continuous flexing or movement. The cable's maximum bend radius is fifteen times the cable diameter.

LED Indicator



Camera Rear View

The LED Indicator on the end of the camera indicates the camera's communications and power status.

Indicator Color	Status
Red	The camera is receiving power but cannot detect the DSL Link carrier. Indicates a damaged cable or bad connection.
Green	The camera is receiving power and detecting the DSL Link carrier.
Blinking Yellow	The camera is acquiring images (blinking may not be visible during fast image acquisition)

Setup and calibration

Use the Impact programs to setup and calibrate the camera with a PPT vision device. (Refer to the Impact Software Reference Guide.)

Calibration insures that measurements shown in Impact software tools accurately indicate the inspected object's measurements. A camera requires calibration when it is first connected to the vision device, when the camera-to-subject distance changes, and when the lens is changed. A calibration target with 0.5, 1.0, and 2.0 mm dot pitches is available from PPT (Part # 381-1177). Contact PPT for printed versions of targets with larger pitches.

Light Sensitivity

The following table shows the camera's relative sensitivity to light.

Camera Model	Imager	Pixel Area	CCD Technology	Relative Sensitivity ²
5200	Sony ICX 424AL	55 sq um	HAD	1

Camera Model	Imager	Pixel Area	CCD Technology	Relative Sensitivity ²
7200 ¹	Sony ICX204AL	21 sq um	HAD	21/55 = 0.38
9200	Sony ECX274AL	19 sq um	Super HAD™ (2x) ³	2 * 19/55 = 0.7

¹The 7200 camera has 2.5 times as many pixels as the 5200, so each pixel is smaller and gathers less light.

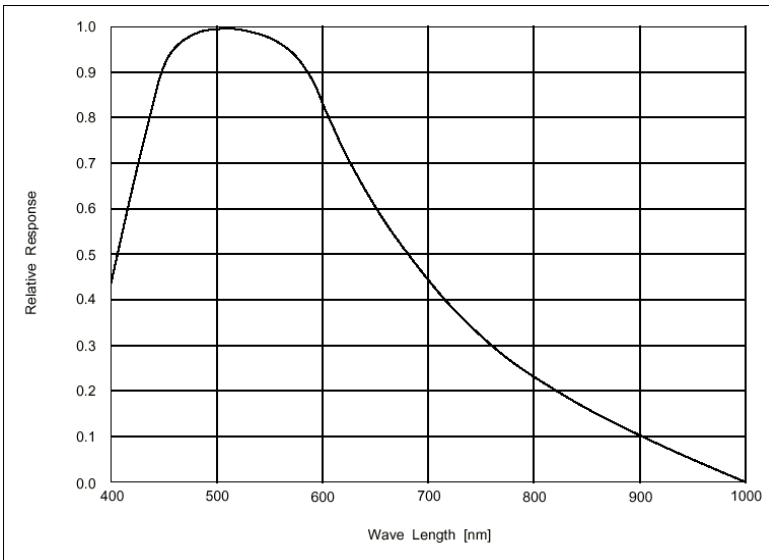
²The color camera models will have the same relative sensitivity to each other (with the 5300 sensitivity as 1).

³Super HAD CCDs are twice as sensitive as normal HAD CCDs.

DSL-5000

Note: Reference only. This camera has an older style body. Mounting dimensions are in the Digital Camera Users Guide (843-0085).

This camera captures a 640 by 480 pixel size image with square pixels. It can partially scan the image horizontally. In half-resolution mode the camera scans every other line to acquire the image twice as fast with half the vertical resolution and twice the gain.



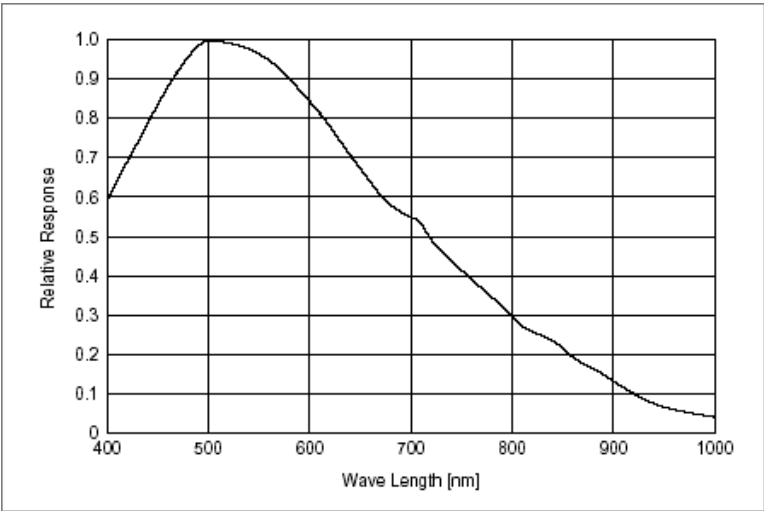
DSL-5000 Spectral Response (excludes lens and light source characteristics)

DSL-5000 Specifications	
PPT Part #	661-0267
Pick-up Device:	Interline Transfer type CCD with 640 (H) x 480 (V) pixels
Image Size:	1/3" (8.47 mm) diagonal – 4.74 (H) x 3.55 (V) mm
Capture Rate, Maximum:	38 images per second full-resolution; 71 images per second at 1/2 vertical resolution; higher rates with partial scan
Optical Fill Factor:	60%
Square Pixel Value:	7.4 x 7.4 micrometers
Gain:	50% to 400%
Shutter Open Time:	47 to 192,512 microseconds
Lens Mount:	C mount
Cabling:	DSL cable provides power, controls, and video. Maximum cable length is 25 meters
Operating Environment:	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)
Power:	12 VDC provided by link (3 Watts)
Weight	0.6 pounds (0.28 kg)
Software version	Impact Software V3.0 or greater

DSL-5100

Note: Reference only. This camera has an older style body. Mounting dimensions are in the Digital Camera Users Guide (843-0085).

This camera captures a 640 by 480 pixel size image with square pixels. It can partially scan the image horizontally.



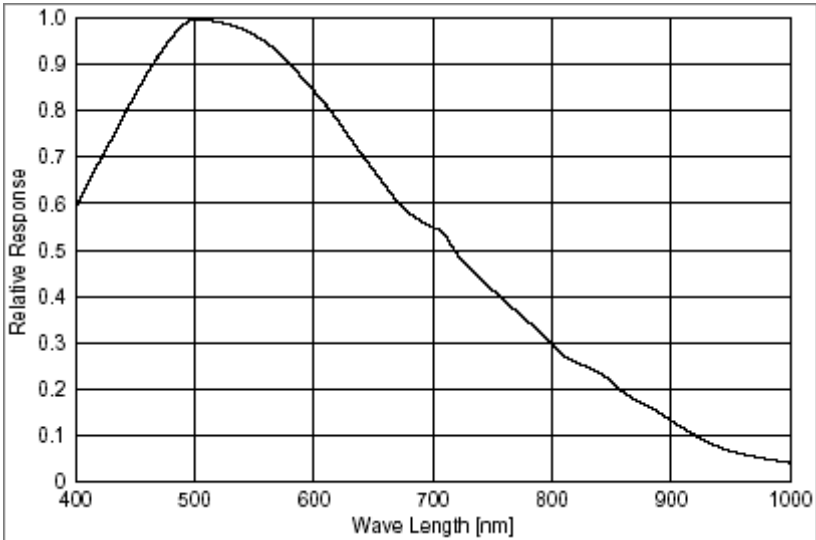
DSL-5100 Spectral Response (excludes lens and light source characteristics)

DSL-5100 Specifications	
PPT Part #	661-0317
Pick-up Device:	Interline Transfer type CCD with 640 (H) x 480 (V) pixels
Image Size:	1/3" (8.47 mm) diagonal – 4.74 (H) x 3.55 (V) mm
Capture Rate, Maximum:	62 images per second full-resolution; higher rates with partial scan
Optical Fill Factor:	60%
Square Pixel Value:	7.4 x 7.4 micrometers
Gain:	50% to 400%

DSL-5100 Specifications	
Shutter Open Time:	32 to 127,795 microseconds
Lens Mount:	C mount
Cabling:	DSL cable provides power, controls, and video. Maximum cable length is 25 meters
Operating Environment:	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)
Power:	12 VDC provided by link (3 Watts)
Weight	0.6 pounds (0.28 kg)
Software version	Impact Software V3.0 or greater

PPT-5200

This camera captures a 640 by 480 pixel size image with square pixels. It can partially scan the image vertically and horizontally.



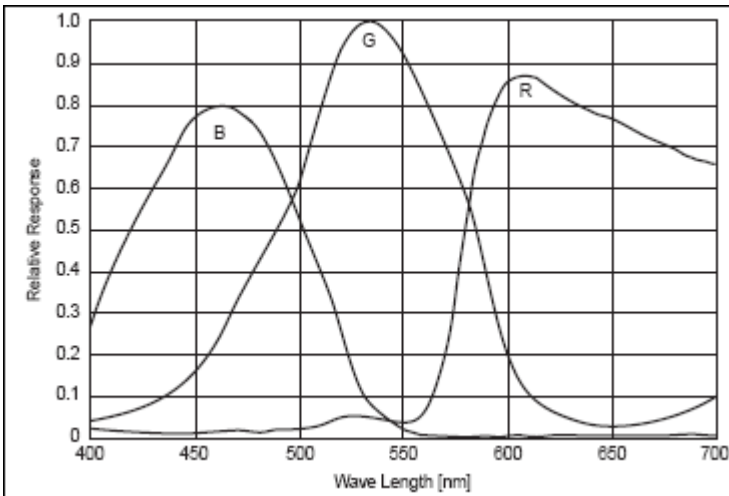
PPT-5200 Spectral Response (excludes lens and light source characteristics)

PPT-5200 Specifications	
Part #	661-0337
Pick-up Device	Interline Transfer type CCD with 640 (H) x 480 (V) pixel image
Image Size	Type ⅓ (5.92 mm diag) – 4.74 (H) x 3.55 (V) mm
Capture Rate	64 fps full-resolution; higher with partial scan
Optical Fill	60%
Pixel Size	7.4 x 7.4 micrometers
Gain	50% to 400%
Shutter Open	31 to 127,795 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters

PPT-5200 Specifications	
Environment	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (3 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software	Impact Software V3.0 or greater

PPT-5300

This camera captures a 640 by 480 pixel size color image with square pixels. It can partially scan the image vertically and horizontally.



PPT-5300 Spectral Response (excludes lens and light source characteristics)

PPT-5300 Specifications	
Part #	661-0364
Pick-up Device	Interline Transfer type CCD with 640 (H) x 480 (V) pixel color image
Image Size	Type 1/3 (5.92 mm diag) – 4.74 (H) x 3.55 (V) mm
Capture Rate	64 fps full-resolution; higher with partial scan
Optical Fill	30%

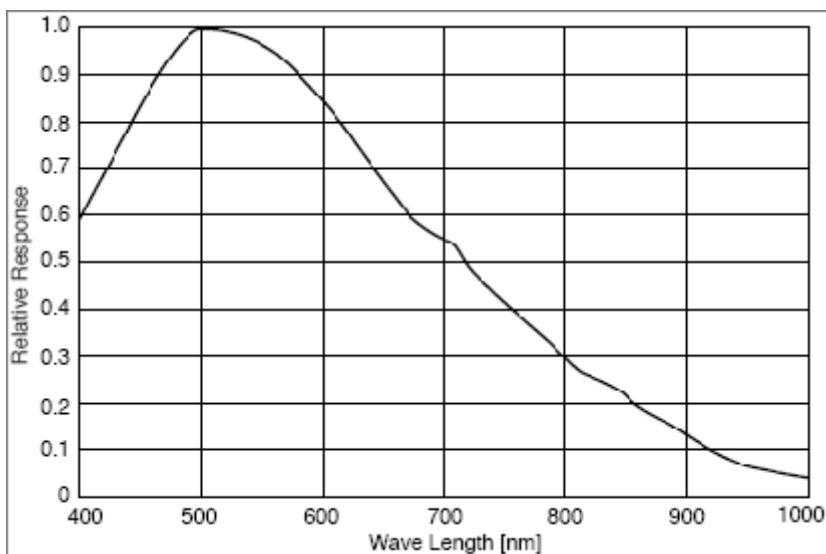
PPT-5300 Specifications	
Pixel Size	7.4 x 7.4 micrometers
Gain	50% to 200%
Shutter Open	31 to 127,795 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters
Environment	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (3 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software	Impact Software V6.5 or greater

PPT-5700

This camera captures a 640 by 480 pixel size image with square pixels. It can partially scan the image vertically and horizontally. It has a small remote head with a 0.8 meter cable attached to the camera body with a sixteen-pin connector.



ATTENTION: The remote head can be damaged by electrostatic discharge if it is disconnected from the camera body.



PPT-5700 Spectral Response (excludes lens and light source characteristics)

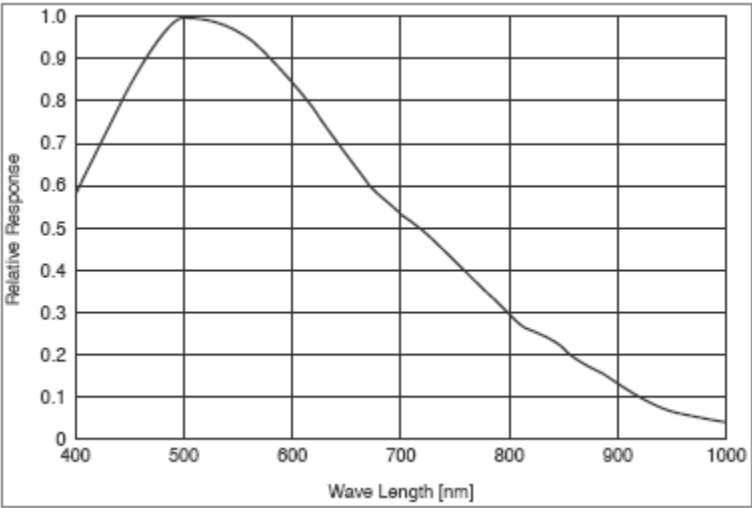
PPT-5700 Specifications

Part #	661-0350
Pick-up Device	Interline Transfer type CCD with 640 (H) x 480 (V) pixel image
Image Size	Type 1/3 (5.92 mm diag) – 4.74 (H) x 3.55 (V) mm
Capture Rate	64 fps full-resolution; higher with partial scan
Optical Fill	60%
Pixel Size	7.4 x 7.4 micrometers
Gain	50% to 400%
Shutter Open	31 to 127,795 microseconds
Lens Mount	External (M15.5 x 0.5) with lens locking ring
Remote Head Cable	0.8 meter cable with 16 pin circular connector
Camera Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters.
Operating Environment	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)

PPT-5700 Specifications	
Power	12 VDC provided by link (3 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software version	Impact Software V3.0 or greater

PPT-6200

This camera captures a 640 by 480 pixel size image with square pixels. It can partially scan the image vertically and horizontally.



PPT-6200 Spectral Response (excludes lens and light source characteristics)

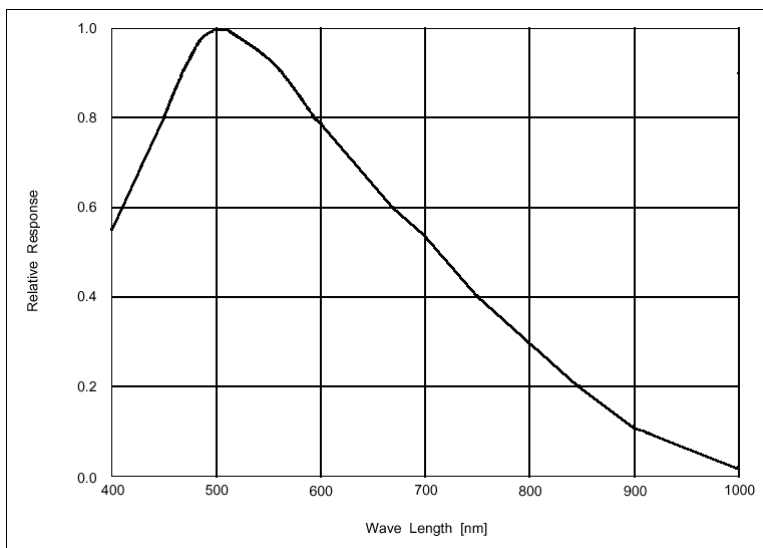
PPT-6200 Specifications	
Part #	661-0348
Pick-up Device	Interline Transfer type CCD with 640 (H) x 480 (V) pixel image
Image Size	Type ½ (7.92 mm diag) – 6.34 (H) x 4.75 (V) mm
Capture Rate	64 fps full-resolution; higher with partial scan
Optical Fill	60%
Pixel Size	9.9 x 9.9 micrometers

PPT-6200 Specifications	
Gain	50% to 400%
Shutter Open	31 to 127,795 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters
Operating Environment	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (3 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software version	Impact Software V3.0 or greater

DSL-7000

Note: Reference only. This camera has an older style body. Mounting dimensions are in the Digital Camera Users Guide (843-0085).

This camera captures an image with a 1024 x 768 pixel size with square pixels. It can partially scan the image horizontally. In half-resolution mode the camera scans every other line to acquire the image twice as fast with half the vertical resolution and twice the gain.



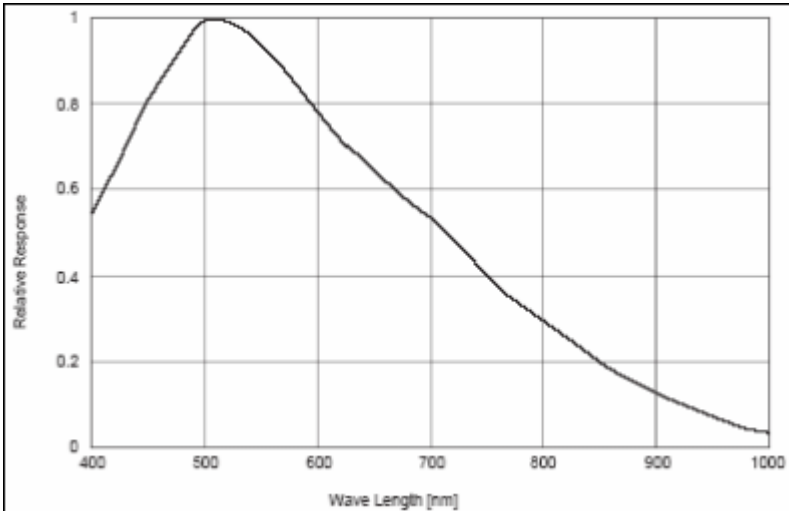
DSL-7000 Spectral Response (excludes lens and light source characteristics)

DSL-7000 Specifications	
PPT Part #	661-0310
Pick-up Device :	Interline Transfer type CCD with 1024 (H) x 768 (V) pixels.
Image Size :	1/3" (6 mm) diagonal – 5.8 mm (H) x 4.92 mm (V)
Capture Rate, Max:	16.5 full-resolution images per second; 28 images per second at ½ vertical resolution; higher rates with partial scan
Optical Fill Factor :	55%
Square Pixel Value :	4.65 x 4.65 micrometers
Gain:	50% to 400%
Shutter Open Time :	77 to 315,392 microseconds
Lens Mount :	C mount
Cabling :	DSL cable provides power, controls, and video. Maximum cable length is 25 meters
Operating Environment:	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)

Power:	12 VDC provided by link (6 Watts)
Weight	0.6 pounds (0.28 kg)
Software version	Impact Software V3.0 or greater

PPT-7200

This camera captures a 1024 by 768 pixel size image with square pixels. It can partially scan the image horizontally.



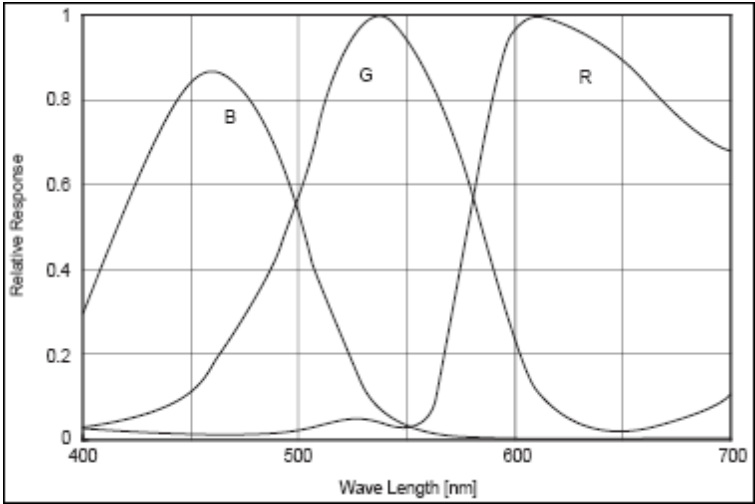
PPT-7200 Spectral Response (excludes lens and light source characteristics)

PPT-7200 Specifications	
Part #	661-0338
Pick-up Device	Interline Transfer type CCD with 1024 (H) x 768 (V) pixel image.
Image Size	Type ⅓ (5.92 mm diag) – 4.76 mm (H) x 3.57 mm (V)
Capture Rate	16.5 full-resolution fps; higher with partial scan
Optical Fill	55%
Pixel Size	4.65 x 4.65 micrometers
Gain	50% to 400%

PPT-7200 Specifications	
Shutter Open	77 to 195,580 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters
Operating Environment	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (3 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software version	Impact Software V3.0 or greater

PPT-7300

This camera captures a 1024 by 768 pixel size color image with square pixels. It can partially scan the image horizontally and vertically.



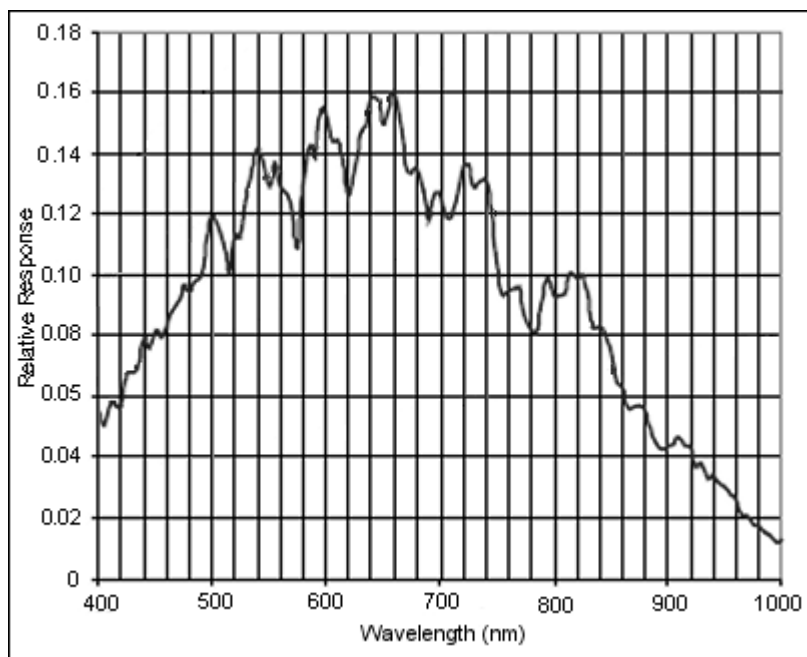
PPT-7300 Spectral Response (excludes lens and light source characteristics)

PPT-7300 Specifications	
Part #	661-0367

PPT-7300 Specifications	
Pick-up Device	Interline Transfer type CCD with 1024 (H) x 768 (V) pixel image.
Image Size	Type ⅓ (5.92 mm diag) – 4.76 mm (H) x 3.57 mm (V)
Capture Rate	16.5 full-resolution fps; higher with partial scan
Optical Fill	55%
Pixel Size	4.65 x 4.65 micrometers
Gain	50% to 200%
Shutter Open	77 to 195,580 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters
Operating Environment	Temperature: -5°+45° C (+23°~114° F) Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (3 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software version	Impact Software V6.6 or greater

PPT-8200

The PPT-8200 camera captures a 1280 by 1024 pixel size image. It has square pixels and can be fully windowed.



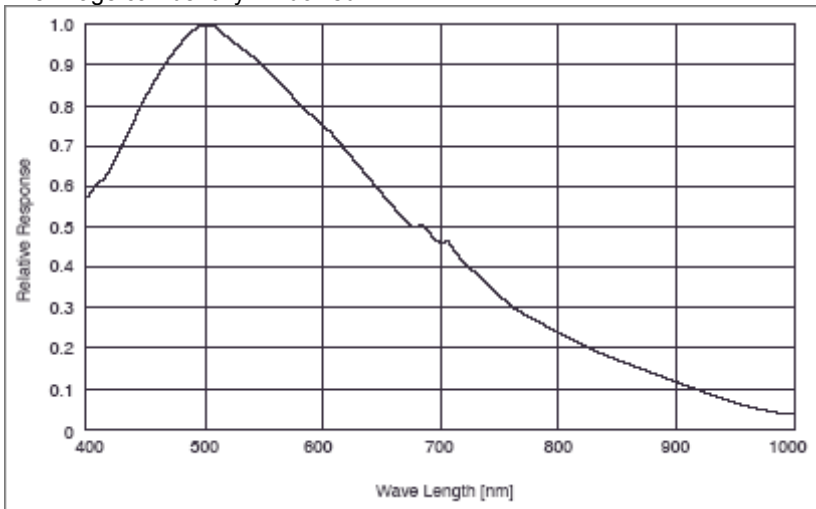
PPT-8200 Spectral Response (excludes lens and light source characteristics)

PPT-8200 Specifications	
Part #	661-0339
Pick-up Device	CMOS active pixel sensor with 1280 (H) x 1024 (V) pixel image.
Image Size	Type $\frac{2}{3}$ (11 mm diag) – 8.6 mm (H) x 6.9 mm (V)
Capture Rate	22.5 full-resolution fps; higher with partial scan
Optical Fill	50%
Pixel Size	6.7 x 6.7 micrometers
Gain	100% to 400%
Shutter Open	31 to 127,100 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters
Operating	Temperature: 0°+45° C (+32°~114° F)

PPT-8200 Specifications	
Environment	Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (2 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software version	Impact Software V3.0 or greater

PPT-9200

This camera captures a 1600 by 1200 pixel size image with square pixels. The image can be fully windowed.



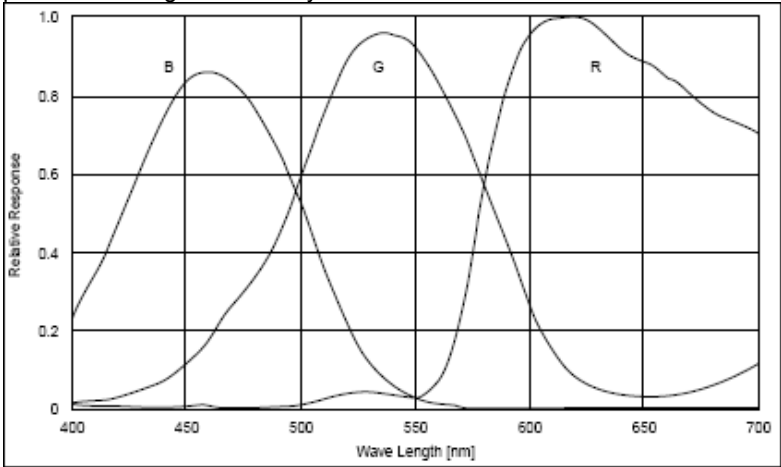
PPT-9200 Spectral Response (excludes lens and light source characteristics)

PPT-9200 Specifications	
Part #	661-0349
Pick-up Device	CCD active pixel sensor with 1600 (H) x 1200 (V) pixel image.
Image Size	Type 1/1.8 (8.8 mm diag) – 7.14 mm (H) x 5.35 mm (V)
Capture Rate	10.6 full-resolution fps; higher with partial scan
Optical Fill	50%

PPT-9200 Specifications	
Pixel Size	4.4 x .4.4 micrometers
Gain	50% to 400%
Shutter Open	77 to 161357 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters
Operating Environment	Temperature: 0°+45° C (+32°~114° F) Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (2 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software version	Impact Software V5.2 or greater

PPT-9300

This camera captures a 1600 by 1200 pixel size color image with square pixels. The image can be fully windowed.



PPT-9300 Spectral Response (excludes lens and light source characteristics)

PPT-9300 Specifications	
Part #	661-0368

PPT-9300 Specifications	
Pick-up Device	CCD active pixel sensor with 1600 (H) x 1200 (V) pixel image.
Image Size	Type 1/1.8 (8.8 mm diag) – 7.04 mm (H) x 5.28 mm (V)
Capture Rate	10.6 full-resolution fps; higher with partial scan
Optical Fill	50%
Pixel Size	4.4 x .4.4 micrometers
Gain	50% to 200%
Shutter Open	77 to 161,357 microseconds
Lens Mount	C mount
Cabling	DSL cable provides power, controls, and video. Maximum length is 25 meters
Operating Environment	Temperature: 0°+45° C (+32°~114° F) Humidity: 20~80% (non-condensed)
Power	12 VDC provided by link (4 Watts)
Weight	0.31 pounds (140 grams); 0.44 pounds (200 grams) with mounting bracket
Software version	Impact Software V6.6 or greater

Camera Link Cameras

Camera Link is an industry standard connection for digital imaging equipment. The PPT C-Series conforms to the Camera Link specification and can use the Camera Link compatible cameras listed here. All cameras are configured using Impact software (V3.0 or greater).

Mfg.	Model	Our Part #	Size (w x h x l)	Weight	Resolution (w x h)	Speed (fps)
Adimec	1000m	601-0304	45 x 45 x 75 mm	185 g	1004 x 1004	30
Adimec	1600m	601-0307	52.5 x 52.5 x 80 mm	250 g	1600 x 1200	17
Adimec	2000m		52.5 mm x 52.5 mm x 80 mm	250 g	1980 x 1080	17
Basler	A102K	601-0303	62 x 62 x 40.2 mm	222 g	1392 x 1040	14.8

Mfg.	Model	Our Part #	Size (w x h x l)	Weight	Resolution (w x h)	Speed (fps)
Basler	L101K-2K	601-0306	62 x 62 x 38.1mm	285 g	2048 Linescan	9300 lines/sec
Cohu	7712	601-0302	52.3 x 52 x 78.7 mm	340 g	1004 x 1003	30
SVS- Vistek	SVS4021 MFCP	601-0316	50 x 55 x 43 mm	200 g	2048 x 2048	11.5

NOTES: Camera specifications are provided by camera manufacturers. PPT Vision is not responsible for changes, errors, or omissions. Refer to manufacturer's camera documentation for current specifications. Only Camera Link cameras listed here are supported by PPT Vision.

Camera Link cameras use one of these standard cables to connect to the PPT device (xx is the cable length of 2, 5, or 10 meters):

Straight connector..... Part # 606-0543-xx
 Right angle connector up Part # 606-0544-xx-U
 Right angle connector down..... Part # 606-0544-xx-D

